NOTES ON SOUTH AFRICAN MARINE ALGAE. IV.

By **George F. Papenfuss.**

(*Department of Botany, University of California.*)

The present paper, like the earlier ones in this series (Papenfuss, 1940, 1943, 1952), is primarily concerned with questions relating to the identity, taxonomy and nomenclature of some of the South African marine algae.

Grateful acknowledgment is made to the Carnegie Corporation of New York for a Grant-in-Aid, received through the University of Cape Town (1939–1940), the Guggenheim Foundation for a Fellowship (1949–1950) and the National Science Foundation for a Grant-in-Aid (1954–) which enabled me to search for (in European herbaria) and to study the types and other published specimens referred to in this paper. The funds granted by the National Science Foundation have also made it possible to secure the services of research assistants to aid in the study of the South African marine algae. I wish to thank Dr. Lois Egerod, Mr. Max Hommersand and Miss Shirley Sparling for valuable assistance. For the loan of specimens I am indebted to the keepers of the herbaria at Birmingham, Hamburg, Kiel and Stockholm.

CHLOROPHYCOPHYTA.

Caulerpa mexicana Sonder ex Kützing.

Caulerpa mexicana Sonder ex Kützing, 1849, p. 496.
C. Harveyana Kützing, 1857, p. 3, pl. 5, fig. iii.
C. crassifolia (C. Agardh) J. Agardh, 1872, p. 13.
C. taxifolia (Vahl) C. Agardh *β crassifolia* C. Agardh, 1822, p. 436.
C. pinnata sensu Weber-van Bosse, 1898, p. 289 (non *Fucus pinnatus* Linnaeus fil., 1781, p. 452; cf. Howe, 1905, p. 574).

This is the first record of the occurrence of this widely distributed species in South Africa. The only South African specimens at hand were collected by Dr. Mary A. Pocock and me at Durban (The Bluff) and Umhlanga Rocks, Natal, in July 1938. These plants are only 1 to 2 cm. high and are smaller than some of those from other parts of the world in which the fronds may attain a height of 10 cm. Dwarf individuals also occur, however, in other regions (cf. Taylor, 1928, p. 96; Børgesen, 1952, p. 9).

Since the time that Howe (1905, pp. 574–576) pointed out that the plant that Linnaeus (1781) described as *Fucus pinnatus* is not the same as the taxon described by C. Agardh (1822) as *Caulerpa taxifolia β crassifolia*, this species has invariably been reported under the name *C. crassifolia* (C. Agardh) J. Agardh. The taxon was first described as a species, however, by Sonder (ex Kützing, 1849) under the name *C. mexicana;* and it is this name rather than *C. crassifolia* that must be used (cf. Art. 70 of the Code).

Weber-van Bosse (1898) established four formae under *Caulerpa pinnata*, two of which, *typica* and *mexicana*, are of concern here. (Both were transferred to *C. crassifolia* by Bǿrgesen, 1907, p. 363.) Forma *typica* is representative of the type of *C. crassifolia* and f. *mexicana* of the type of *C. mexicana*. In view of the restoration of the specific epithet *mexicana* and in conformity with the current Code (Art. 35), the form representative of the type of *C. mexicana* would continue to bear the name *mexicana* and, if it were recognized, f. *typica* would have to receive another name. In consideration of the somewhat doubtful taxonomic value of all the formae recognized under *C. pinnata* or *C. crassifolia*, it seems best, however, to refrain from giving any of them formal recognition under *C. mexicana* at this time. (Bǿrgesen, loc. cit., has remarked that intermediates often occur between f. *typica* and f. *mexicana*.)

As regards the synonymy of this species, it should be pointed out that J. Agardh (1872, p. 14) included (with a query) *Caulerpa obtusa* Lamouroux (1809*a*, p. 332; 1809*b*, p. 143), of uncertain source but perhaps from the Antilles, in the synonymy of *C. crassifolia* var. *mexicana*. To my knowledge, the type of *C. obtusa* has never been re-examined. Lamouroux's illustration of the species (1809*b*, pl. 6, fig. 3) suggests a plant rather unlike conventional *C. mexicana* but some of the specimens of the latter species from Bermuda in the herbarium of the University of California do show some resemblance to Lamouroux's illustration. It is thus not inconceivable that *C. obtusa* and *C. mexicana* are conspecific and that the former binomial will have to replace the latter as the correct name of this species.

PHAEOPHYCOPHYTA.

Halopteris funicularis (Montagne) Sauvageau.

Halopteris funicularis (Montagne) Sauvageau, 1904, p. 393, fig. 80.
Sphacelaria funicularis Montagne, 1842*a*, p. 13.

Synonyms or misidentifications based wholly or in part on South African material.

Stypocaulon funiculare (Montagne) Kützing. Reinke, 1891, p. 22; Barton, 1893, p. 111; De Toni, 1895, p. 517. (These three records are based on Areschoug's *Sphacelaria globifera*.)

Anisocladus congestus Reinke, 1890, p. 213; 1891, p. 32 (only as to South African material—not as to lectotype from New Zealand); De Toni, 1895, p. 520 (cited from Reinke); Barton, 1896, p. 197 (cited from Reinke); Delf and Michell, 1921, p. 97.

Sphacelaria globifera Areschoug, 1851, p. 20; 1854, p. 364.

Sphacelaria paniculata sensu Krauss, 1846, p. 213; sensu J. Agardh, 1848, p. 36; sensu Areschoug, 1851, p. 19. (Non *Sphacelaria paniculata* Suhr, 1840, p. 278.)

Stypocaulon paniculatum sensu Hohenacker, 1854, No. 154; sensu Magnus, 1873, p. 142, pl. 2, fig. 42; sensu Barton, 1893, p. 111 (cited from Krauss); sensu De Toni, 1895, p. 516 (cited from J. Agardh). (Non *Sphacelaria paniculata* Suhr.)

Sphacelaria scoparia sensu Harvey, 1838, p. 396; 1846, text to pl. 37 (p.p.); sensu Drège, 1843, pp. 111, 223 (on p. 111 in error as *Sphaerococcus scoparius*); sensu Areschoug, 1851, p. 21 (cited from Drège and Harvey). (Non *Halopteris scoparia* (L.) Sauvageau.)

Stypocaulon scoparium sensu Kützing, 1849, p. 466 (cited from Harvey); sensu Barton, 1893, p. 111; sensu De Toni, 1895, p. 518 (cited from Kützing). (Non *Halopteris scoparia* (L.) Sauvageau, cf. Sauvageau, 1904, p. 376.)

As will be evident from the somewhat lengthy synonymy given above, the South African material of *Halopteris funicularis* has been the source of a good deal of confusion. Until the time of Sauvageau (1904), who was the first to clarify the situation as regards the identity of the South African plant, published accounts (e.g., De Toni, 1895) conveyed the impression that the Stypocaulaceae were represented in South Africa by some five species: *H. funicularis*, *H. congesta*, *H. scoparia*, *Stypocaulon paniculatum* (=?*H. hordacea*) and *Phloiocaulon squamulosum*. Actually, as far as is known, only two species occur in South Africa: *H. funicularis* and *P. squamulosum*. I have examined representative specimens of all the published records based on South African material, as listed in the synonymy above, with the exception of that of Drège (1843, pp. 111, 223) and have found them to be of *H. funicularis*.

A brief review of a few of the points relating to the history of *Halopteris funicularis*, especially as regards its synonyms that are based wholly or in part on South African material, may be useful.

The species, as *Sphacelaria funicularis*, was first described by Montagne (1842*a*) from material from Auckland Island. The type material is in Montagne's collection in the cryptogamic herbarium of the Muséum National d'Histoire Naturelle, Paris, where I have seen it. Sauvageau (1904, p. 394) has pointed out that it is not possible to determine with certainty whether the type material is representative of *Halopteris* *funicularis* (as circumscribed by him) or of *H. congesta* and he (p. 395) has accordingly designated sporophytic material from Chile, reported upon by Montagne in 1852 (p. 267), as typical of his concept of *H. funicularis.* Since the time of Sauvageau's monograph of the Sphacelariales, investigators have followed his circumscription of *H. funicularis* and I have done the same as regards the South African material of *Halopteris.*

On the basis of material from South Africa, Areschoug (1851) described this species as new to science under the name *Sphacelaria globifera.* Reinke (1891) reduced *S. globifera* to the synonymy of *Stypocaulon funiculare* (*H. funicularis*).

In more recent times (cf. Delf and Michell, 1921, p. 97) this taxon has passed in South Africa as *Anisocladus congestus* Reinke. Reinke (1890) described the monotypic genus *Anisocladus* from material from South Africa and New Zealand, without designating a type. Sauvageau (1900–1914, pp. 293, 411–415) reduced *Anisocladus* to the synonymy of *Halopteris* but retained Reinke's species as an autonomous taxon, *H. congesta.* This species shows a striking resemblance to *H. funicularis*—in fact, can be distinguished from it with certainty only on the basis of a character presented by fertile sporophytic plants: in *H. funicularis* the clusters of unilocular sporangia contain intermingled paraphyses whereas in *H. congesta* they lack paraphyses.

Among the specimens of *Halopteris* from South Africa available to him, Sauvageau could find none that was referable to *H. congesta*—all were of *H. funicularis.* He, however, did not see Reinke's material. Representative specimens of *Halopteris* collected by me in South Africa were sent to Miss Moore several years ago, when she was working on the New Zealand species of this genus (Moore, 1951, 1953), but the fertile sporophytic and hence identifiable specimens all proved to be of only one species—*H. funicularis.*

During the summer of 1954 I had an opportunity to visit the University of Kiel, where Reinke's herbarium is conserved, and to arrange for a loan of his material of *Anisocladus congestus.* Reinke had three specimens from South Africa: one from Port Natal named "Sphacelaria paniculata Hering", one labelled "Cap. bon. sp. (ex herb. Jessen.)", and the third one labelled "Port Natal 1839 leg. Krauss". Both the specimens from "Port Natal" are gametophytic whereas the one from "Cap. bon. sp." is sporophytic. The last-named specimen is definitely representative of *Halopteris funicularis.* Miss Moore (1951, p. 277), who has had a great deal of experience with both *H. funicularis* and *H. congesta*, is not certain that these two species can be distinguished on the basis of sexual plants. Since, to judge from the sporophytic plants, only one species of *Halopteris*, *H. funicularis*, occurs in South Africa, it seems reasonable to conclude that the gametophytic plants among Reinke's South African material, as well as those in my own and other collections, are also representative of *H. funicularis*. As is true of the various species of *Halopteris* that Miss Moore has studied, the gametophytic plants of *H. funicularis* are oogamous.

On the basis of my examination of Reinke's material, *Halopteris congesta* may thus with reasonable certainty be excluded from the South African flora. New Zealand therefore constitutes the type region of this species and I propose as lectotype a sporophytic specimen that Reinke received from von Mueller and that is labelled "North Island, New Zealand 1889".

Finally, it is necessary to say a few words about the geographic distribution of *Halopteris funicularis* in South Africa. On the basis of material collected by Krauss (1846, p. 213), this species was reported from Port Natal (now Durban) under one or another of the names listed in the synonymy above by J. Agardh (1848, p. 36), Areschoug (1851, p. 19), Magnus (1873, p. 142), Barton (1893, p. 111) and De Toni (1895, p. 516). In spite of the fairly extensive and intensive collecting that has been done in the Durban region in recent times, *H. funicularis* has never again been obtained in this part of South Africa. It is extremely doubtful that the specimens in question were collected at Port Natal. More likely they were secured in the Cape Peninsula or in the region of Cape Agulhas whence Hohenacker (1854) had material for distribution and where I obtained it in quantity in the drift at Struis Bay. As in the New Zealand-Australia region (cf. Moore, 1953, map 9), *H. funicularis* in South Africa is a plant of the colder waters—along the south and west coasts of the Cape Province.

Chnoospora minima (Hering) Papenfuss, comb. nov.

Fucus minimus Hering, 1841, p. 92.

Chnoospora pacifica J. Agardh, 1847, p. 7.

Chnoospora fastigiata J. Agardh var. *pacifica* (J. Agardh) J. Agardh, 1848, p. 172.

On the basis of material collected by Krauss (1846, p. 213) at Port Natal, Hering in 1841 described a plant from South Africa under the name *Fucus minimus*. Hering's diagnosis was very brief and did not permit recognition of the species by subsequent phycologists. Endlicher (1843, p. 29) associated the species with the marine lichen known for a long time by the name *Fucus pygmaeus*, and he was followed in this disposition of the taxon by De Toni (1895, p. 209). Kützing (1849, p. 590) included Hering's species in his list of species of *Fucus* but he did not see material of it. Barton in 1896 (p. 195) reduced the species to the synonymy of the South African plant now known as *Carpomitra filiformis* (Suhr) Papenfuss (1943, p. 82).

It was evident that Barton had seen some of Hering's original material and it seemed likely that a specimen would be on file either in the herbarium of the British Museum or in that of Kew. I searched for such a specimen at these institutions in 1939 and 1950 but to no avail. Search in many European herbaria was equally fruitless until the summer of 1954 when an authentic specimen was finally found in the herbarium of the Staatsinstitut für allgemeine Botanik at Hamburg, and arrangements were made for the loan of it. The label accompanying this specimen contains the inscription "Fucus minimus Hering nov. species Port Natal Coll. Dr. Krauss Cap. b. sp. e herbaria Heringiana" and also the diagnosis as published by Hering. Furthermore, this is the specimen that Barton saw as is evident from the annotation "Carpomitra chytraphora Kütz." in her hand.

Hering's specimen (which I have designated lectotype) is a small fragment but examination of it leaves no question that it is not representative of *Carpomitra filiformis* but is identical with the widely distributed plant that was described by J. Agardh (1847) as *Chnoospora pacifica* from material from "St. Augustin" on the Pacific Coast of Mexico (type, No. 50087 in Herb. Agardh!). Since *Fucus minimus* Hering antedates *Chnoospora pacifica* J. Agardh, the latter name must yield to the new combination *Chnoospora minima* (Hering) Papenfuss.

Chnoospora minima is a reasonably common alga along the east (warmer) coast of South Africa. The species was reported from South Africa by Barton (1896, p. 195, as *C. fastigiata*) and by Levring (1938, p. 21, as *C. pacifica*), who also gave some good illustrations of its habit and anatomy.

RHODOPHYCOPHYTA.

Galaxaura magna Kjellman.

Galaxaura magna Kjellman, 1900, p. 82, pl. 15, figs. 1–10, pl. 20, fig. 46.
Corallopsis dichotoma Suhr, 1839, p. 70, pl. 3, fig. 44. (Non *Galaxaura dichotoma* Lamouroux ex Decaisne, 1842, p. 116.)

The identity of *Corallopsis dichotoma* Suhr (1839) has been uncertain since the species was founded. Harvey (1846, text to pl. 69) reduced the taxon to the synonymy of the plant now known as *Scinaia furcellata* (Turner) Bivona (a species which does not occur in South Africa) and he was followed in this by Kützing (1849, p. 715). J. Agardh (1852, p. 423) placed the species, with a query, in the synonymy of *Scinaia salicornioides* (Kützing) J. Agardh and he was followed by De Toni (1897, p. 106), who, however, later (1900, p. 461) also listed it under *species inquirendae*.

Setchell (1914, p. 108) was apparently the first person to have examined some of Suhr's material of *Corallopsis dichotoma*. He obtained a fragment (part of which is still in the herbarium of the University of California) of a specimen that is on file in the National Herbarium of Victoria and from a study of it concluded that the species agrees well with the description and figures of the South African plant described as *Galaxaura magna* by Kjellman (1900). By implication Setchell designated the specimen in the National Herbarium of Victoria as lectotype of *C. dichotoma*.

During the summer of 1954, I found another of Suhr's specimens in the herbarium of the University of Kiel, filed at the end of the genus *Galaxaura*. This specimen is labelled "Corallopsis dichotoma" in Suhr's hand and with it are notes by him. The collector and locality (merely given as "Von der südafrikanischen Küste" in his paper) are given as "Ecklon in der Algoa Bay". Anatomical examination of the Kiel specimen as well as of the fragment of the Melbourne specimen has shown that both are representative of *G. magna*. Both specimens are of sexual plants. This generation is less distinctive than the tetrasporangial generation and may be confused with the sexual generation of the South African plant that Zanardini (1846; 1862, pl. 31, figs. B1–5) described as *G. Diesingiana*. However, on the basis of our present knowledge of these two species—thanks to the magnificent paper on the South African species of *Galaxaura* by Svedelius (1942)—and by comparison with the material of both species in my collection, there is little question of the identity of *Corallopsis dichotoma* with *G. magna*. In *G. magna* the cortex of sexual plants is thinner and the medulla is thicker than in sexual plants of *G. Diesingiana*.

Since *Corallopsis dichotoma* Suhr (1839) antedates *Galaxaura magna* Kjellman (1900), it would have been necessary to replace the latter specific epithet with the former, were it not for the fact that the binomial *G. dichotoma* already exists. In 1842 (p. 116) Decaisne described under this name a manuscript species of Lamouroux based on material from Guadeloupe and Cuba. (The identity of *G. dichotoma* Lamouroux ex Decaisne still remains to be clarified as far as I have been able to determine.)

Rhodophyllis reptans (Suhr) Papenfuss, comb. nov.

Halymenia reptans Suhr, 1834, p. 735, pl. 2, figs. 17, S; Kützing, 1866, p. 32, pl. 91, figs. c–f.
Rhodophyllis capensis Kützing, 1849, p. 786; 1869, p. 19, pl. 50, figs. g–l.
Rhodymenia nigricans Harvey, 1847, pl. 46 (*nomen nudum*).
Ectoclinium kowiense Holmes, 1896, p. 349.

Suhr in 1834 described a species from Algoa Bay as *Halymenia reptans* and in 1841 a species from "Cap" as *Phyllophora reptans*. A good deal of uncertainty has existed as regards the identity of these two species and at times they were confused with each other. J. Agardh (1852*a*, p. 480), Grunow (1867, p. 82) and Schmitz (1894, p. 201, footnote) thought *Phyllophora reptans* was merely a small form of *Gelidium pristoides*. Kylin (1938) regarded it as an autonomous species of *Gelidium*, *G. reptans* (Suhr) Kylin, an opinion with which I concur.

From a study of one of Suhr's specimens in Reinbold's herbarium, Schmitz (loc. cit.) concluded that *Halymenia reptans* is a species of *Rhodophyllis* which might be identical with *R. capensis* Kützing, the type of which is a specimen collected by Pappe at Kalk Bay. During the summer of 1954, I found in the herbarium of the University of Kiel another of Suhr's original specimens which I borrowed for study. It is labelled in Suhr's hand "Halymenia reptans S Am Fuss der Halymenia furcellata β. Algoa-Bay." I have designated this specimen as lectotype. Study of it has revealed that this taxon actually is conspecific with *R. capensis* Kützing, and since Suhr's binomial is the older, it becomes necessary to make the new combination *Rhodophyllis reptans* (Suhr) Papenfuss.

Harvey (1847) in his day had illustrated and distributed specimens of the species under the name *Rhodymenia nigricans* but in accordance with Art. 44 of the Code this name must be treated as a *nomen nudum*.

In 1950 I had an opportunity of searching for and of arranging for the loan of various specimens of South African marine algae in the herbarium of the University of Birmingham that were published by Holmes. (These and other specimens have since been deposited in the herbarium of the British Museum.) Among these were the type and two other specimens of the plant described by Holmes (1896) as *Ectoclinium kowiense* on the basis of material received from Becker, who collected it at "The Kowie" (Port Alfred). Examination of this material has shown that *E. kowiense* is a species of *Rhodophyllis*, and there appears to be little question that it is identical with *R. reptans*. In fact, one of Holmes' specimens is a plant that Becker distributed under the name "Halymenia reptans Suhr". Holmes compared his species with *Rhodophyllis* but states (p. 349) " . . . the nemathecioid sorus of tetraspores at once distinguishes the plant from the genus *Rhodophyllis*". The tetrasporangium bearing tips of this plant agree well with those of *R. reptans* and other species of this genus and are quite unlike those of *E. dentatum* (the type of this genus), which, as illustrated by J. Agardh (1879, pl. 30), contain paraphyses intermingled with the sporangia.

Plants of *Rhodophyllis reptans* from Port Alfred and other localities of the south-eastern coast of South Africa are generally slenderer than those occurring in False Bay and adjacent regions, which correspond to the type of *R. capensis*, but anatomically the two kinds of thalli appear to be identical.

Nienburgia serrata (Suhr) Papenfuss, comb. nov.

Nitophyllum serratum Suhr, 1836, p. 342, pl. 4, fig. 29.

The identity of *Nitophyllum serratum* has been uncertain ever since the species was established by Suhr in 1836. Kützing (1849, p. 869) included it in his list of *Species dubiae*, J. Agardh (1852*b*, p. 672) listed it under *Species inquirendae* and thought it might be the juvenile stage of a *Plocamium*, and De Toni (1900, p. 665) placed it under *Species minus notae aut quoad sectionem incertae*.

During the summer of 1954 I found in the herbarium of the University of Kiel the only specimens of Suhr's material of *Nitophyllum serratum* that I have seen. The specimens consist of a few small bits on mica in an envelope and are labelled as collected at "Algoa Bay" and with them are notes on the species by Suhr, his original pencil drawings of it and the printed description and figures. I have designated this material as lectotype of *N. serratum*.

Examination of Suhr's material revealed that it is representative of a small serrated member of the Delesseriaceae that has been collected by Dr. Mary A. Pocock and me at a number of localities along the southeast and east coasts of South Africa. Some years ago this plant was identified as representative of *Nienburgia* Kylin (1935), which genus was originally described by Kylin (1924, p. 46) under the name *Heteronema*. It was thought that the South African plant probably represented a new species and it is gratifying to have found that it is the long-lost *Nitophyllum serratum* of Suhr. The species should therefore be known as *Nienburgia serrata* (Suhr) Papenfuss.

The occurrence in South Africa of a species of *Nienburgia* constitutes an interesting extension of the geographic distribution of this genus. Heretofore, as far as I am aware, *Nienburgia* has been credited with only three species, *N. Andersoniana* (J. Agardh) Kylin, *N. borealis* (Kylin) Kylin, and *N. japonica* (Yamada) Kylin—all from the North Pacific.

Placophora monocarpa (Montagne) Papenfuss, comb. nov.

Polysiphonia monocarpa Montagne, 1842*b*, p. 254; 1846, p. 89, pl. 143, fig. 3; 1856, p. 424; Harvey, 1847, p. 56; Kützing, 1849, p. 807; 1863, p. 13, pl. 38, figs. d-h; J. Agardh, 1863, p. 941; Barton, 1893, p. 176.

Herposiphonia? monocarpa (Montagne) De Toni, 1903, p. 1061.

Placophora Eckloniae Pocock ex Scagel, 1953, pp. 36-39; Pocock, 1953, p. 37, figs. 2, 6, pl. 7.

On the basis of material obtained in South Africa by Guadichaud, during the voyage of the *Bonite*, the polysiphonous reproductive filaments of this species were described by Montagne (1842*b*) as a new species of *Polysiphonia*—*P. monocarpa*. These filaments were later illustrated by Montagne (1846) and Kützing (1863).

Duplicates of the material collected by Guadichaud were available to several later phycologists (Harvey, 1847; Kützing, 1849, 1863; Barton, 1893) but none of them contributed to a better understanding of the species. De Toni in 1903 transferred *Polysiphonia monocarpa* to *Herposiphonia*, with a query. In associating it with *Herposiphonia* he probably was influenced by Montagne's comment that the species formed a velvety layer on the larger brown algae.

I have seen specimens of the original material of *Polysiphonia monocarpa* in the collections of Thuret (Paris), Kützing (Leiden) and Harvey (Dublin) and in the herbaria of Kew and the British Museum of Natural History. Microscopic examination of fragments of the material in the collections of Thuret and Kützing revealed that the polysiphonous filaments spring from a pseudoparenchymatous prostrate system (which apparently escaped the notice of Montagne, Harvey, Kützing and Barton) and that the species is representative of the genus *Placophora*.

Comparison of *Polysiphonia monocarpa* with the two known species of *Placophora*, *P. Binderi* and *P. Eckloniae*—both based on material from South Africa, has shown that Montagne's species is identical with *P. Eckloniae*, which has been well described by Scagel (1953) and Pocock (1953). It thus becomes necessary to make the new combination *Placophora monocarpa* (Montagne) Papenfuss and to reduce *P. Eckloniae* to the synonymy of this binomial.

Since the time that Guadichaud collected the original material of *Placophora monocarpa*, over a hundred years ago, the species escaped the notice of collectors in South Africa until a few years ago when Dr. Pocock rediscovered it. She has obtained it at a number of localities and always as an epiphyte on the stipe of *Ecklonia maxima* (Pocock, 1953, p. 39). Montagne mentioned only "ad Fucos majores" as the substratum, but it seems very likely that his material likewise grew on *E. maxima*. The characteristic formation of only one cystocarp on each of the polysiphonous filaments of female plants, which suggested the specific epithet *monocarpa*, is clearly shown in plate 7 (figure g) of Dr. Pocock's paper.

REFERENCES.

AGARDH, C. A.
1822. Species algarum . . . Vol. 1 (2). [8] + pp. 169–531. Lund.

AGARDH, J. G.
1847. Nya alger från Mexico. Öfv. K. Sv. Vet.-Akad. Förhandl. 4: 5–17.
1848. Species genera et ordines algarum, . . . Vol. 1. viii + 363 pp. Lund.
1851. Species genera et ordines algarum, . . . Vol. 2 (1). xii + 336 pp. + [addenda and index, pp. 337–351]. Lund.
1852*a*. Species genera et ordines algarum, . . . Vol. 2 (2: 1). Pp. 337–504. Lund.
1852*b*. Species genera et ordines algarum, . . . Vol. 2 (2: 2). Pp. 505–700 + [addenda and index, pp. 701–720]. Lund.
1863. Species genera et ordines algarum, . . . Vol. 2 (3:2). Pp. 787–1291. Lund.
1872. Till algernes systematik. [afd. 1]. Lunds Univ. Årsskr. 9 (afd. 2, nr 8). 71 pp.
1879. Florideernes morphologi. K. Sv. Vet.-Akad. Handl. 15 (6). 199 pp., 33 pls.

ARESCHOUG, J. E.
1851. Phyceae capenses. 32 pp. Uppsala (Thesis).
1854. Phyceae novae et minus cognitae in maribus extraeuropaeis collectae quas descriptionibus observationibusque illustravit. Nova Acta R. Soc. Sc. Upsal., ser. 3, 1: 329-372.

BARTON, ETHEL S.
1893. A provisional list of the marine algae of the Cape of Good Hope. Journ. Bot. 31: 53-56, 81–84, 110–114, 138–144, 171–177, 202–210.
1896. Cape algae. Journ. Bot. 34: 193-198, 458–461, 5 figs.

BØRGESEN, F.
1907. An ecological and systematic account of the Caulerpas of the Danish West Indies. K. Danske Vidensk. Selsk. Skrifter, 7 Raekke, Naturvidensk. Math. Afd., 4: 337–392, 31 figs.
1952. Some marine algae from Mauritius. Additions to the parts previously published, IV. K. Danske Vidensk. Selsk. Biol. Medd. 18 (19). 72 pp., 33 figs., pls. 1–5.

DECAISNE, J.
1842. Mémoire sur les corallines ou polypiers calcifères. Ann. Sc. Nat. Bot., sér. 2, 18: 96–128.

DELF, ELLEN M. and MARGARET R. MICHELL.
1921. The Tyson collection of marine algae. Ann. Bolus Herb. 3: 89–119.

DE TONI, J. B.
1895. Sylloge algarum . . . Vol. 3. Fucoideae. xvi + 638 pp. Padua.
1897. Sylloge algarum . . . Vol. 4. Florideae, Sect. 1. xx + lxi + 386 + [2] pp. Padua.
1900. Sylloge algarum . . . Vol. 4. Florideae, Sect. 2. Pp. 387–773. Padua.
1903. Sylloge algarum . . . Vol. 4. Florideae, Sect. 3. Pp. 775–1521 + 1523 [bis]–1525 [bis]. Padua.

DRÈGE, J. F.
1843. Zwei pflanzengeographische Documente. Flora 26 (Besondere Beigabe). 230 pp., 1 map.

ENDLICHER, S. L.
1843. Mantissa botanica altera. Sistens generum plantarum, suppl. 3. [6] + 111 pp. Vienna.

GRUNOW, A.
1867. Algae, in Reise der österreichischen Fregatte Novara um die Erde . . . Bot. Theil 1. Pp. 1–104, pls. 1, 1A, 2–11. Vienna.

HARVEY, W. H.
1838. The genera of South African plants, . . . lxvi + 429 pp. Cape Town.
1846. Phycologia britannica: . . . Vol. 1. xv pp., 120 plates and accompanying text of unnumbered pages + viii pp. London.
1847. Nereis australis, . . . viii + 124 pp., 50 pls. London.

HERING, K.
1841. Diagnoses algarum novarum a cl. Dre. Ferdinand Krauss in Africa australi lectarum. Ann. Mag. Nat. Hist. 8: 90–92.

HOHENACKER, R. F.
1854. Algae marinae siccatae, Lief. 4: Nos. 151–200.

HOLMES, E. M.
1896. New marine algae. Journ. Bot. 34: 349–351.

HOWE, M. A.
1905. Phycological studies—II. New Chlorophyceae, new Rhodophyceae and miscellaneous notes. Bull. Torrey Bot. Club 32: 563–586, pls. 23–29.

KJELLMAN, F. R.
1900. Om floridé-slägtet *Galaxaura* dess organografi och systematik. K. Sv. Vet.-Akad. Handl. 33 (1). 109 pp., 20 pls.

KRAUSS, F.
1846. Pflanzen des Cap- und Natal-Landes, Algae. Flora 29: 209–215.

KÜTZING, F. T.
1849. Species algarum. vi + 922 pp. Leipzig.
1857. Tabulae phycologicae . . . Vol. 7. ii + [1] + 40 pp., 100 pls. Nordhausen.
1863. Tabulae phycologicae . . . Vol. 13. [1] + 31 pp., 100 pls. Nordhausen.
1866. Tabulae phycologicae . . . Vol. 16. [iv] + 35 pp., 100 pls. Nordhausen.
1869. Tabulae phycologicae . . . Vol. 19. iv. + 36 pp., 100 pls. Nordhausen.

KYLIN, H.
1924. Studien über die Delesseriaceen. Lunds Univ. Årsskr. N. F. Avd. 2, 20 (6). 111 pp., 80 figs.
1935. Zur Nomenklatur einiger Delesseriaceen. K. Fysiogr. Sällskap. Lund Förhandl. 5 (23). 5 pp.
1938. Verzeichnis einiger Rhodophyceen von Südafrika. Lunds Univ. Årsskr. N. F. Avd. 2, 34 (8). 26 pp., 10 figs., 8 pls.

LAMOUROUX, J. V. F.
1809*a*. Observations sur la physiologie des Algues marines, et description de cinq nouveaux genres de cette famille. Nouv. Bull. Sc. Soc. Philom., sér. 2, 1: 330–333, pl. 6, fig. 2.
1809*b*. Mémoire sur les Caulerpes, nouveau genre de la famille des Algues marines. Journ. Bot. [Desvaux] 2: 136–146, pls. 5–7.

LEVRING, T.
1938. Verzeichnis einiger Chlorophyceen und Phaeophyceen von Südafrika. Lunds Univ. Årsskr. N. F. Avd. 2, 34 (9). 25 pp., 10 figs., 4 pls.

LINNAEUS, C.
1781. Supplementum plantarum . . . [16] + 467 pp. Brunswick.

MAGNUS, P.
1873. Zur Morphologie der Sphacelarieen nebst Bemerkungen über die Ablenkung des Vegetationspunktes der Hauptachse durch den nahe am Scheitel angelegt werdenden Tochterspross. Festschr. Feier Hundertjähr. Ges. Naturforsch. Freunde Berlin. Pp. 129–156, 4 pls.

MONTAGNE, [J. F.] C.
1842*a*. Prodromus generum specierumque phycearum novarum, in itinere ad polum antarcticum . . . 16 pp. Paris.
1842*b*. Troisième centurie de plantes cellulaires exotiques nouvelles. Ann. Sc. Nat. Bot., sér. 2, 18:241–282.
1846. Cryptogames cellulaires: Algues, in A. N. Vaillant, Voyage autour de monde exécuté pendant les années 1836 et 1837 sur la corvette *la Bonite*, Botanique (by Gaudichaud), Vol. 3. Pp. i–xi, 1–112. Paris.
1852. Algas, in C. Gay, Historia fisica y politica de Chile . . . , Botanico, Vol. 8. Pp. 228–393. Paris.

1856. Sylloge generum specierumque cryptogamarum . . . xxiv + 498 pp. Paris.

MOORE, LUCY B.

1951. Reproduction in *Halopteris* (Sphacelariales). Ann. Bot. N. S., 15: 265–278, 54 figs.

1953. Some distribution problems illustrated from brown algae of the genus *Halopteris*. Proc. Seventh Pacific Sc. Congress, Vol. 5. Pp. 13–18, 10 maps.

PAPENFUSS, G. F.

1940. Notes on South African marine algae. I. Bot. Not. 1940: 200–226, 16 figs.

1943. Notes on South African marine algae. II. Journ. S. Afr. Bot. 9: 79–92.

1952. Notes on South African marine algae. III. Journ. S. Afr. Bot. 17: 167–188.

POCOCK, MARY A.

1953. South African parasitic Florideae and their hosts. 1. Four members of the Rhodomelaceae which act as hosts for parasitic Florideae. Journ. Linn. Soc. London Bot. 55: 34–47, 9 figs., pls. 5–9.

REINKE, J.

1890. Uebersicht der bisher bekannten Sphacelariaceen. Ber. Deutsch. Bot. Ges. 8: 201–215, 3 figs., 2 charts.

1891. Beiträge zur vergleichenden Anatomie und Morphologie der Sphacelariaceen. Bibl. Bot. 5 (Heft 23). 40 pp., 13 pls.

SAUVAGEAU, C.

1900–1914. Remarques sur les Sphacélariacées. xii + 634 pp., 128 figs. (Pp. 1–348 appeared in Journ. de Bot. 14–18.) Bordeaux.

SCAGEL, R. F.

1953. A morphological study of some dorsiventral Rhodomelaceae. Univ. Calif. Publ. Bot. 27: i–iv, 1–108, 20 figs.

SCHMITZ, [C. J.] F.

1894. Neue japanische Florideen von K. Okamura. Hedwigia 33: 190–201, pl. 10.

SETCHELL, W. A.

1914. The *Scinaia* assemblage. Univ. Calif. Publ. Bot. 6: 79–153, incl. pls. 10–16.

SUHR, J. N.

1834. Uebersicht der Algen, welche von Hrn. Ecklon an der südafrikanischen Küste gefunden worden sind. Flora 17: 721–735, 737–743, pls. 1, 2.

1836. Beiträge zur Algenkunde. Flora 19: 337–350, pls. 3, 4.

1839. Beiträge zur Algenkunde. Flora 22: 65–75, pls. 1–4.

1840. Beiträge zur Algenkunde. Flora 23: 257–265, 273–282, 289–298.

1841. Beiträge zur Algenkunde. Verhandl. K. Leopold.-Carol. Akad. Naturf. 18, Suppl. 1: 273–288, 3 pls.

SVEDELIUS, N.

1942. Zytologisch-entwicklungsgeschichtliche Studien über *Galaxaura* eine diplobiontische Nemalionales-Gattung. Nova Acta Reg. Soc. Sc. Upsal. ser. 4, 13 (4). 154 pp., 80 figs.

TAYLOR, W. R.

1928. The marine algae of Florida with special reference to the Dry Tortugas. Papers Tortugas Lab. Carnegie Inst. Wash. 25. (Carnegie Inst. Wash. Publ. No. 379.) [4] + 219 pp., 3 figs., 7 tables, 37 pls.

WEBER-VAN BOSSE, ANNA.

1898. Monographie des Caulerpes. Ann. Jardin Bot. Buitenzorg 15: 243–401, pls. 20–34.

ZANARDINI, G.

1846. Del vero posto che alle *Galaxaura* si compete nella serie dei vegetabili marini. Giorn. Bot. Ital. 2: 48–52.

1862. Scelta di ficee nuove o piú rare del mare Adriatico figurate, descritte ed illustrate (decade terza). Mem. Ist. Veneto Sc. Lett. 10: 447–484, pls. 26–33.